Diagenesis, dehydration and deformation of pelagic sediments in ancient subduction zone inferred from bedded chert

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Radioralian ribbon chert is an important component of orogenic belt and a key geologic element to define accretionary complexes formed in subduction zone. Existence of thick bedded cherts is also critical signal to identify old oceanic plate subduction because the accumulation of pelagic chert suggests a long period exposure of oceanic plate under the ocean floor. Bedded cherts exposed in the Inuyama region of the Mino belt in central Japan are one of the most well studied radiolarian cherts from the point of view of biostratigraphy and structure. On the basis of the detail biostratigraphy, it has been revealed that about 100m thick primary sequence is repeated by almost layer-parallel thrust faults. Age difference between the oldest chert and youngest terrigenous shale covering the cherts is about 100 m.y. The chert sequence records a history from deposition under the open ocean through initial stage of diagenesis to final accretion by thrust stacking. I have focussed on a relationship between the diagenesis and subduction-accretion related deformation mainly on the basis of field observation and microscopic analysis.

Deformation order from the field and microscopic observation is as follows,
1) White chert layer repeatedly appear in red bedded chert.
2)White cherts are folded in systematic fashion suggestive of intrafolial deformation associated with the accretion.
3) White chert layers are deformed by dense microcracks filled by chalcedny and Polygonal quartz aggregate , all of which are involved in the fold.
4) Polygonal quartz aggregate is ovserved largely in fold hinge part than fold limb part.
5) Pressure solution cleavages are fomed in red chert layer.
6) Marices of the white chert except for the veined part show chemical difference from the red chert in abundant Si component.

All these feature of chert layer suggest that the bedded cherts were folded in association with diagenesis from opal CT to quarts transition, and white chert layer worked as a conduit of fluid. Guessed phase transition from opal CT to quarts takes place under the temperature condition from about 70C to 120C. Therefore, these process appears to have occurred rather in shallow portion of the subduction zone just above the seismogenic zone beyond about 150C.

Such inference is consistent with thrust stacking due to layer parallel faulting and folding, which might be related to plate boundary process and deformation in subduction zone.